

REMARKS

Prior to entry of this paper, claims 1-24 were pending. In the Office Action dated December 29, 2005, Claims 4 and 6-19 were allowed, and Claims 1, 3, 5, 20, 21, and 23 were rejected. Claims 2, 22, and 24 were identified as being allowable if re-written in independent form.

Applicants' representative and the Examiner held a telephonic interview on January 10, 2006. In this interview, the rejection to Claims 1, 20, 21, and 23 were discussed.

Applicants' representative asked for further clarification for what was deemed to be the "differential intermediate signal" used in the rejection of Claim 1. The Examiner stated that VBE1 and VBE2 of Claim 20 of Kunst, as shown in FIGs. 8, 10, 11, or 12 of Kunst, was the differential intermediate signal.

The Examiner declined to give consideration to Claims 1, 20, 21 at the interview, stating that he instead preferred to receive a response to the Office Action stating the Applicants' arguments with regard to Claims 1, 20, and 21.

With regard to Claim 23, Applicants' representative pointed out that multiplexer 630 of Kunst is a C:1 (C-by-one) multiplexer circuit, not a 2:2 (two-by-two) multiplexer circuit. Additionally, the Examiner and Applicants' representative agreed that the rejection to Claim 23 should be withdrawn, and that Claim 23 contains allowable subject matter.

Accordingly, the status of the Claims is now as follows. Claims 4 and 6-19 are allowed; Claims 1, 3, 5, 20, and 21 stand rejected; and Claims 2, 22, 23, and 24 are objected to but allowable if re-written in independent form.

In this paper, Claims 21-24 are amended. Claims 21 and 24 were amended to correct clerical errors. Claims 22 and 23 were amended to be re-written in independent form. Claims 1-24 are currently pending. No new matter is added by way of this amendment. For at least the following reasons, Applicants respectfully submit that each of the presently pending claims is in condition for allowance.

Allowable Subject Matter (Claims 2, 4, 6-19, and 22-24)

Claims 4 and 6-19 are allowed. Applicants thank the Examiner for his work on this matter.

Claims 2 and 22-24 were objected to, but were identified as being allowable if re-written in independent form. In this paper, Claims 22 and 23 are re-written in independent form. For at least this reason, Claims 22 and 23 are in condition for allowance. Claim 24 depends on Claim 23. For at least these reasons, Claims 22-24 are in condition for allowance.

Claim 2 is respectfully submitted to be in condition for allowance because it depends on Claim 1, which is proposed to be allowable for the reasons stated below.

Rejections under 35 U.S.C. § 102(b) (Claims 1, 3, 5, 20, and 21)

Claims 1, 3, 5, 20, and 21 were rejected under 35 U.S.C. §102(b) as being anticipated by Kunst (U.S. Patent No. 6,008,685). Each of the rejections is respectfully traversed.

Claim 1 is respectfully submitted to be allowable at least because Kunst does not disclose, “two signal channels that are configured to receive, at first and second sense nodes, a differential input signal from a dual junction temperature sensor circuit, and further configured to provide a differential intermediate signal from the differential input signal” (as recited in Applicants’ Claim 1), in conjunction with the other limitations of Applicants’ Claim 1.

Switches S1 and S2 of Kunst do not provide a differential intermediate signal from a differential input signal in conjunction with the other claim limitations. The Office Action states that Col. 14, lines 47-49 of Kunst provide support for this. Col. 14, lines 47-49 refer to a circuit providing a reference voltage, such as the circuit of FIG. 8, 9, 12, or 13 of Kunst. One of the circuits shown in FIG. 8, 9, 12, or 13 of Kunst may be used as the voltage reference circuit 625 of FIG. 6 of Kunst. However, the diodes D1 and D2 of Kunst that are inside of the voltage reference circuit 625 are not the same diodes as diodes 650-1 through 650-C of Kunst. The signal received by switches S1 and S2 do not provide current to the diodes D1 and D2 within the voltage reference circuit 625; rather, switches S1 and S2 provide current to the sensor diodes such as diode 650-1.

The fundamental problem with the rejection is that it seems to confuse voltages VBE1 and VBE2 in the bandgap reference (i.e. the “source of the reference voltage” referred to in Claim 20 of Kunst) with the sensor diodes (e.g. diodes 650-1 through 650-C of FIG. 6 of Kunst, or the “sensors” of Claim 1 of Kunst, where said sensors may be diodes as per Claim 8 of Kunst). The sensor

diodes (e.g. diode 650-1 of Kunst) and the diodes in the bandgap reference (D1 and D2 of Kunst) are separate diodes that should not be confused with each other.

The rejection to Claim 1 appears to be based on the mistaken impression that each of the bandgap reference circuits shown in FIG. 8, 9, 11, and 12 of Kunst is an alternative embodiment of the entire circuit of FIG. 6 of Kunst, in which the diodes D1 and D2 of FIG. 8, 9, 11, and/or 12 of Kunst are embodiments of diodes 650-1 through 650-N of FIG. 6 of Kunst. However, this is not the case. Rather, the circuits of FIGs. 8, 9, 11, and 12 of Kunst are bandgap reference circuits which may be used as the voltage reference 625 of FIG. 6 of Kunst. As stated at Col. 8, lines 15-19 of Kunst, "Also presented in the circuit of FIG. 6 is a voltage reference circuit 625 for providing the V_{REF} voltage used in measurement circuit 620. More will be said below about desirable implementations for voltage reference circuit 625." The "more" that is said "below" occurs in Col. 11, line 28 through Col. 12, line 50 of Kunst with reference to FIGs. 8-12 of Kunst. FIG. 8 of Kunst shows a prior art bandgap voltage reference. Kunst discusses that the circuit of FIG. 8 may be used as voltage reference 625 of FIG. 6, but also discusses certain limitations of the circuit of FIG. 8. Kunst then goes on to describe, with reference to FIGs. 9-12, bandgap reference circuits which, according to Kunst, overcome certain prior art limitations of the bandgap reference circuit.

In any case, a bandgap reference circuit outputs a reference voltage V_{REF} that is relatively independent of temperature. Diodes D1 and D2 of Kunst and other components of the bandgap reference circuit operate together to generate the reference voltage V_{REF} . Voltages V_{BE1} and V_{BE2} of diodes D1 and D2 respectively of Kunst are not converted into a temperature signal. Instead, in FIG. 6 of Kunst, a single-ended voltage from a diode (e.g. diode 650-1 of Kunst) of whichever temperature is currently being measured is converted into a temperature by measurement circuit 620 of Kunst. The currents of circuit 610 are switched into the diodes 650-1 through 650-C of Kunst. The current from circuit 610 is not conducted to diodes D1 and D2 of Kunst within the voltage reference.

This is further shown in the claims of Kunst. Claim 1 of Kunst refers to "means for measuring a voltage, V_{BE} , at each of said sensors for each application of said currents." Claim 8 of Kunst recites, "The system of Claim 1 wherein at least one of said sensors is a diode". The "sensors" refer to, for example, diodes 650-1 through 650-C of FIG. 6 of Kunst. Claim 20 of Kunst

depends on Claim 10, which in turn depends on Claim 1. Claim 20 of Kunst recites, “wherein said **source of reference voltage comprises first and second diodes**, providing respective voltage VBE1 and VBE2 when stimulated by respective applied currents” (emphasis added). Note that the diodes referred to in Claim 20 of Kunst are not the sensors, and they do not receive the same current as received by the sensors as referred to in Claim 1 of Kunst.

Simply put, in Kunst, the diodes D1 and D2 of the reference voltage circuit, providing voltages VBE1 and VBE2 as referred to, inter alia, in Column 14, lines 47-49, should not be confused with the diodes 650-1 through 650-N of FIG. 6.

The Office Action states that S1 and S2 of FIG. 6 of Kunst are two signals channels that convert a differential input signal into a digital intermediate signal, where the digital intermediate signal is the voltages VBE1 and VBE2 of Col. 12, lines 47-49 of Kunst. However, voltages VBE1 and VBE2 discussed at Col. 12, lines 47-49 are the diodes of the bandgap reference circuit. S1 and S2 of FIG. 6 of Kunst do not have any effect on diodes voltages in the reference voltage circuit. S1 and S2 of FIG. 6 of Kunst influence the diode voltages of the sensor diodes 650-1 through 650-C, not the diodes in the reference voltage circuit.

Accordingly, Kunst does not disclose, “two signal channels that are configured to receive, at first and second sense nodes, a differential input signal from a dual junction temperature sensor circuit, and further configured to provide a differential intermediate signal from the differential input signal” (as recited in Applicants’ Claim 1), in conjunction with the other limitations of Applicants’ Claim 1.

Also, Applicants' Claim 1 is respectfully submitted to be allowable at least because Kunst does not disclose, "a conversion circuit that is configured to convert the differential intermediate signal into a digital temperature signal that is associated with a remote temperature", as recited in Applicant's Claim 1. As previously discussed, measurement circuit 620 of Kunst performs conversion based on a single-ended voltage, for whichever of the voltages 640-1 through 640-C of Kunst it is measuring at any given time. Measurement circuit 620 of Kunst does NOT in some way use more than one of the voltages 640-1 through 640-C to calculate a single temperature based on separate diodes.

Rather, temperature determinations are made separately for the location of each of the diodes 650-1 through 650-C of Kunst, each of which are at separate locations and may each have a separate temperature. Further, the Office Action contends that measurement circuit 620 of Kunst converts the difference between diodes D1 and D2 of the bandgap reference voltage circuit 625 into a temperature. However, diodes D1 and D2 of Kunst are used for providing the reference voltage; they are not converted into a temperature. It is the single-ended voltage from whichever of the diodes 650-1 through 650-C of Kunst that is currently being measured that is used for determining the temperature, NOT the diodes D1 and D2 in the bandgap reference.

Accordingly, Kunst does not disclose, “a conversion circuit that is configured to convert the differential intermediate signal into a digital temperature signal that is associated with a remote temperature”, as recited in Applicants’ Claim 1.

Additionally, Claim 1 is respectfully submitted to be allowable at least because Kunst does not disclose, “a first multiplexer circuit that is configured to control the differential intermediate signal” (in conjunction with the other claim limitations), as recited in Applicants’ Claim 1. The Office Action contends that the differential intermediate signal is provided by diodes D1 and D2 in the bandgap reference 625 of Kunst. However, the diode voltages in the bandgap reference of Kunst are not multiplexed.

For at least these reasons, it is respectfully submitted that Claim 1 is allowable.

Claims 3, 5, and 21 are respectfully submitted to be allowable at least because they depend on Claim 1, which is proposed to be allowable.

Additionally, Claim 21 is respectfully submitted to be allowable at least because Kunst does not disclose “the conversion circuit is configured to provide the digital temperature signal such that the remote temperature is calculated based on a voltage difference between the two pn junctions in the dual junction temperature sensor”, as recited in Applicants’ Claim 21.

The circuit of FIG. 6 of Kunst calculates the temperature at the diode 650-1, calculates the temperature at the diode 650-2, and calculates the temperature at the diode 650-3. The circuit of FIG. 6 of Kunst does NOT use the different two or more of the diodes 650-1 through 650-C to determine a single temperature. Rather, each temperature determination is made independently of the others.

Further, as previously discussed, the difference between VBE1 and VBE2 of diodes D1 and D2 of FIG. 8, FIG. 9, FIG. 11, and FIG. 12 of Kunst are not used to calculate the remote temperature. Rather, the temperature at the location of the each of the diodes 650-1 through 650-C of Kunst is based on the single-ended voltage of that diode, rather than being calculated based on the voltages VBE1 and VBE2 of the bandgap reference. Voltages VBE1 and VBE2 of Kunst are used to provide a reference voltage that is substantially independent of temperature.

Claim 20 is respectfully submitted to be allowable at least for reasons analogous to those stated above with regard to Claim 21.

CONCLUSION

It is respectfully submitted that each of the presently pending claims (Claims 1-24) are in condition for allowance and notification to that effect is requested. Examiner is invited to contact the Applicants' representative at the below-listed telephone number if it is believed that the prosecution of this application may be assisted thereby. Although only certain arguments regarding patentability are set forth herein, there may be other arguments and reasons why the claimed invention is patentable. Applicants reserve the right to raise these arguments in the future.

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Respectfully submitted,

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